



Sex differences in weight perception and weight gain among Black college students in the USA

Jounghee Lee¹, Jaesin Sa², Jean-Philippe Chaput³, James Heimdal⁴, Beatrice Nelson⁵,
Beom-Young Cho⁶, Elizabeth Kwon⁷

¹Department of Food and Nutrition, Kunsan National University, Gunsan, Korea

²College of Education and Health Sciences, Touro University, Vallejo, CA, USA

³Department of Pediatrics, University of Ottawa, Ottawa, ON, Canada

⁴Department of Human Performance and Sport Sciences, Tennessee State University, Nashville, TN, USA

⁵Department of Kinesiology, University of Maryland Eastern Shore, Princess Anne, MD, USA

⁶Division of Public Health Sciences, Washington University, St. Louis, MO, USA

⁷Department of Human Development and Family Science, University of Georgia, Athens, GA, USA

ABSTRACT

Objectives: The aims of this study were to examine the prevalence of overweight/obesity and to explore sex differences in body weight perceptions and correlates of weight gain among Black students at 2 historically Black colleges and universities (HBCUs) in the USA.

Methods: Participants completed a paper-based survey, and their height and weight were measured (67% completion rate).

Results: The overweight and obesity rates were 33.8% and 26.9%, respectively. More females than males accurately assessed their weight ($p < 0.05$). Body weight underestimation was associated with male sex, excellent/very good perceived overall health, and not being informed by a doctor of having overweight or obesity ($p < 0.01$). Higher odds of $\geq 5\%$ weight gain were related to female sex, living on campus, and not being informed by a doctor of having overweight or obesity ($p < 0.05$).

Conclusion: Given the high overweight and obesity rates among Black students, HBCUs in the USA should develop intervention strategies for the prevention and management of overweight and obesity. College health educators at HBCUs need to provide regular check-ups or health screenings that help male students perceive their weight accurately and prevent weight underestimation. It is important for HBCUs to monitor and address weight gain among Black students as early as possible.

Keywords: Obesity; Sex characteristics; Students; Universities; Weight gain; Weight perception

Received: September 15, 2020

Revised: January 5, 2021

Accepted: January 27, 2021

Corresponding author:

Jaesin Sa

College of Education and

Health Sciences, Touro

University, 310 Moore St.

Vallejo, CA 94592, USA

E-mail: jaesin.sa@tu.edu

Introduction

The prevalence of overweight/obesity among college students in the USA increased from

31.3% in 2008 to 39.7% in 2019 [1,2]. Overweight/obesity and weight gain during adulthood are related to an increased risk of diabetes, cardiovascular disease, and some forms of cancer [3]. Given that the prevalence of overweight/obesity in adults aged 20 to 39 years is about twice as high as that in adolescents aged 12 to 19 years [4], the transition from adolescence to adulthood is a critical period for weight gain [5,6], and college years may be a time of particular risk for overweight and obesity [7]. Maintaining an active lifestyle and healthy eating habits could be challenging for college students due to a lack of family support and established routines [7]. Thus, when students transition from high school to college, many face drastic changes in their environment and residence that may influence health behaviors such as diet and exercise [5]. The health behaviors of college students are important because health habits established during their college years could affect life-long weight struggles and future health problems [5]. Despite reports of rapid weight gain during the college years [7], investigations of weight gain among college students have been scarce [8].

Unlike investigations of overweight and obesity among US adults that have provided race/ethnicity-specific rates of overweight and obesity, very few studies have examined racial/ethnic differences in overweight and obesity among US college students [9]. In 2007, a US national study of 24,613 students from 119 four-year colleges reported that non-Hispanic Blacks had higher rates (38.3%) of overweight and obesity than non-Hispanic Whites (26.7%), non-Hispanic Asians (16.4%), and Hispanics (30.2%) [9]. The high rates of overweight/obesity in Black college students may be due, in part, to body weight perceptions [10] and associated weight management behaviors [11]. Evidence shows that accurate weight perception plays an important role in weight loss attempts [11]. Furthermore, weight underestimation is a predictor of weight gain over time [10] and a barrier to weight management behaviors among adults [12].

Sex [13] and race/ethnicity [14] are crucial determinants of body weight perception. In a statewide school-based survey, 24.5% of male adolescents underestimated their weight, which was 3 times higher than the prevalence reported in female adolescents [13]. A similar sex difference was reported in Black college students [15]. In addition, weight underestimation was more prevalent in Black female adolescents than in their White counterparts [13]. To date, however, a paucity of research exists on weight perception in Black college students [16] despite their higher rates of overweight and obesity than other racial/ethnic groups [9]. Thus, the current study aimed to investigate the prevalence of overweight/obesity and to examine sex differences in

body weight perceptions and correlates of weight gain among Black college students at 2 historically Black colleges and universities (HBCUs).

Materials and Methods

Participants

A purposive sample of Black students from 2 HBCUs in the USA was recruited for this cross-sectional study. After the Institutional Review Boards at Tennessee State University (IRB No: HS2015-3675) and University of Maryland Eastern Shore (IRB No: #2016-016) approved the protocol, 325 undergraduate students enrolled in health courses were invited to participate in a paper-based survey in March 2016. A total of 318 students completed the survey. All participants provided written consent for their personal data to be used. Twenty-five participants at each university were randomly selected and each of them received a \$25 gift card as reimbursement. This sample initially consisted of 278 Black students, 4 Native Hawaiian or Pacific Islander students, 25 White students, and 11 students of other racial backgrounds. Data from 278 Black students, our population of interest, were used for the current study. We excluded 59 participants who did not report anthropometric characteristics ($n=1$) or socio-demographic data ($n=10$). The present study focused on investigating the health-related variables that are correlated with weight gain. Thus, participants ($n=48$) with missing responses pertinent to the health-related items were excluded. The final sample was composed of 219 participants, reflecting a completion rate of 67%.

Measures

We developed a 34-item paper questionnaire adapted from the following previously validated and reliable instruments: the American College Health Association-National College Health Assessment [17], National Longitudinal Survey of Youth [18], and National Health and Nutrition Examination Survey [19]. The questionnaire was pilot-tested with 10 Black students at the 2 HBCUs to evaluate the questionnaire wording and respondents' understanding of questions. Data from the pilot test were not included in the study.

To measure body mass index (BMI), anthropomorphic data were collected using a Detecto scale (Detecto Scale Company, Webb City, MO, USA). After completing the questionnaire, participants stood on the scale, wearing light clothes/no shoes, and their height and weight were measured twice. The mean of each measurement was recorded. BMI was calculated as weight (kilograms) divided by height (meters squared) [20]. Participants' BMI status

was classified as follows: (1) underweight, $<18.5 \text{ kg/m}^2$; (2) normal weight, $18.5\text{--}24.9 \text{ kg/m}^2$; (3) overweight, $25.0\text{--}29.9 \text{ kg/m}^2$; and (4) obesity, $\geq 30 \text{ kg/m}^2$.

Body weight perception was measured by the question, "Do you consider yourself now to be...?" Response options were "underweight," "about the right weight," and "overweight." Body weight perceptions were divided into 3 categories based on the concordance, or lack thereof, between perceived weight status and actual BMI status, which was objectively measured and computed by the lead author: (1) underestimation (perceived weight status $<$ BMI status); (2) accurate estimation (perceived weight status = BMI status); and (3) overestimation (perceived weight status $>$ BMI status) [21]. Each student's weight change was computed by subtracting his/her self-reported weight in the previous year from his/her self-reported current weight. Weight gain was defined as a $\geq 5\%$ increase in weight relative to weight 1 year ago [22,23]. Participants were categorized as having $\geq 5\%$ or $< 5\%$ weight gain.

Questions on sociodemographic characteristics included the type of residence (on-campus vs. off-campus) and annual household income. The poverty threshold level was computed using the 2015 federal poverty level guidelines to determine poverty status [24]. Health behavior questions were asked to assess participants' dietary intake of alcohol, fruits, vegetables, soda, and fast foods. Questions about sedentary behavior were asked to measure time sitting on a typical day and daily television/video/computer screen time use. Health status questions were asked to gauge students' perceived health status and whether or not a doctor had ever informed them of their overweight status. Physical activity questions were asked to measure the number of days/week and minutes/day participants engaged in the following physical activities for 10 minutes: (1) walking or bicycling; (2) moderate-intensity sports, fitness, or recreational activities causing small increases in the breathing or heart rate; and (3) vigorous-intensity sports, fitness, or recreational activities causing large increases in the breathing or heart rate. These physical activity questions were used to create a metabolic equivalent (MET) variable that was calculated by multiplying walking/bicycling by 4.0, moderate-intensity activities by 4.0, and vigorous-intensity activities by 8.0 [25]. Based on these MET values, participants' activity level was classified into 2 categories, inactive ($< 500 \text{ MET-min/wk}$) and active ($\geq 500 \text{ MET-min/wk}$) [23,25].

Data Analysis

The chi-square test and the Cramer's V-test were performed to investigate the significance of differences in categorical

variables (e.g., sociodemographic characteristics and health behaviors) and weight perceptions between male and female participants. Multivariable logistic regression models were developed to identify correlates of weight underestimation and $\geq 5\%$ weight gain over 1 year among students with overweight or obesity. Independent variables in the multivariable logistic regression models were selected based on previous research that found associations with weight underestimation and weight gain [11,12,26,27]. All analyses were conducted with Stata ver. 13 (StataCorp., College Station, TX, USA). We set the level of significance at 0.05.

Results

This study included a total of 219 participants with a mean age of 19.8 years (standard deviation, 1.5 years), of whom 54.8% were male. As shown in Table 1, 37.9% of participants had an annual income $\geq \$60,000$, 27.4% had an annual income between $\$30,000$ and $\$59,999$, and 14.6% had an annual income $< \$30,000$. Almost 3 out of 4 participants lived on campus (74.0%). The campus setting was a rural town for 64.8% of participants, while 35.2% of them were in a very large city.

The proportions of weight status were as follows: underweight, 2.3%; normal weight, 37.0%; overweight, 33.8%; and obesity, 26.9%. Sex was moderately associated with perceived overall health (Cramer's $V = 0.283$). More females than males (27.3% vs. 10.8%; $p = 0.001$) perceived their overall health as fair or poor. More males than females (93.5% vs. 83.0%; $p = 0.025$) reported $\geq 500 \text{ MET-minutes/week}$ of physical activity. Only 22.4% of participants consumed ≥ 3 daily servings of fruits and vegetables. Almost half of participants (49.3% and 46.6%, respectively) consumed fast food ≥ 3 times and drank a soft drink ≥ 3 times in the past 7 days (Table 1).

As shown in Table 2, sex was moderately associated with body weight perceptions in all weight status categories: (1) normal weight group, Cramer's $V = 0.399$; (2) overweight group, Cramer's $V = 0.290$; and (3) obese group, Cramer's $V = 0.352$. Among participants with normal weight, more females than males (88.1% vs. 66.7%; $p = 0.001$) estimated their body weight accurately. We observed similar results in participants with overweight or obesity, indicating that females had more accurate weight perceptions than males, regardless of their weight categories (Table 2).

Higher odds of body weight underestimation were associated with (1) male sex, (2) not being informed of being overweight by a doctor, and (3) being physically active ($\geq 500 \text{ MET-min/wk}$; $p < 0.05$) (Table 3).

Higher odds of $\geq 5\%$ weight gain were associated with (1)

Table 1. Characteristics of participants

Variable	Total (n = 219)	Male (n = 120)	Female (n = 99)	Effect size ^{a)}	p
Annual household income				0.187	0.054
Don't know	44 (20.1)	31 (25.8)	13 (13.1)		
< \$30,000	32 (14.6)	13 (10.8)	19 (19.2)		
≥ \$30,000 & < \$60,000	60 (27.4)	34 (28.3)	26 (26.3)		
≥ \$60,000	83 (37.9)	42 (35.0)	41 (41.4)		
Poverty threshold (n = 205)				0.082	0.239
Above	177 (86.3)	97 (89.0)	80 (83.3)		
Below	28 (13.7)	12 (11.0)	16 (16.7)		
Type of residence				0.047	0.490
On-campus	162 (74.0)	91 (75.8)	71 (71.7)		
Off-campus	57 (26.0)	29 (24.2)	28 (28.3)		
Campus setting				0.112	0.099
Very large city	77 (35.2)	48 (40.0)	29 (29.3)		
Rural town	142 (64.8)	72 (60.0)	70 (70.7)		
Weight status				0.138	0.239
Underweight	5 (2.3)	2 (1.7)	3 (3.0)		
Normal	81 (37.0)	39 (32.5)	42 (42.4)		
Overweight	74 (33.8)	47 (39.2)	27 (27.3)		
Obese	59 (26.9)	32 (26.7)	27 (27.3)		
Informed of being overweight by a doctor				0.072	0.345
Yes	55 (24.9)	26 (22.0)	28 (28.3)		
No	164 (75.1)	94 (78.0)	71 (71.7)		
Perceived overall health				0.283	0.001
Excellent	27 (12.3)	15 (12.5)	12 (12.1)		
Very good	64 (29.2)	47 (39.2)	17 (17.2)		
Good	88 (40.2)	45 (37.5)	43 (43.4)		
Fair/poor	40 (18.3)	13 (10.8)	27 (27.3)		
Metabolic equivalent (min/wk)				0.149	0.025
< 500	26 (11.8)	8 (6.5)	17 (17.0)		
≥ 500	193 (88.2)	112 (93.5)	82 (83.0)		
Monthly frequency of alcohol use (d)				0.015	0.976
0	89 (40.6)	48 (40.0)	41 (41.4)		
1-14	119 (54.3)	66 (55.0)	53 (53.5)		
15-30	11 (5.0)	6 (5.0)	5 (5.1)		
Daily fruit and vegetable consumption (serving)				0.042	0.822
0	22 (10.0)	13 (10.8)	9 (9.1)		
1-2	148 (67.6)	79 (65.8)	69 (69.7)		
≥ 3	49 (22.4)	28 (23.3)	21 (21.2)		
Weekly frequency of eating fast foods (time)				0.123	0.193
0	44 (20.1)	20 (16.7)	24 (24.2)		
1-2	67 (30.6)	42 (35.0)	25 (25.3)		
≥ 3	108 (49.3)	58 (48.3)	50 (50.5)		
Weekly frequency of drinking a soft drink or soda containing sugar (time)				0.094	0.379
0	59 (26.9)	30 (25.0)	29 (29.3)		
1-2	58 (26.5)	29 (24.2)	29 (29.3)		
≥ 3	102 (46.6)	61 (50.8)	41 (41.4)		
Daily sitting hours	5.8 ± 3.7	5.7 ± 3.4	5.9 ± 4.0	-	0.640
Daily screen time	8.4 ± 7.2	9.1 ± 7.4	7.5 ± 6.9	-	0.141

Data are presented as n (%) or mean ± SD. The percentages may not add to 100 because of a lack of responses or rounding errors.

^{a)}Cramer's V effect sizes were judged as negligible associations if < 0.1, weak associations if between 0.1 and < 0.2, moderate associations if between 0.2 and < 0.4, and strong if ≥ 0.4.

Table 2. Body weight perceptions by sex

Variable	Total	Male	Female	Effect size ^{a)}	p
Normal weight (n = 81)				0.399	0.001
Underestimation	15 (18.5)	13 (33.3)	2 (4.8)		
Accurate estimation	63 (77.8)	26 (66.7)	37 (88.1)		
Overestimation	3 (3.7)	0 (0.0)	3 (7.1)		
Overweight (n = 74)				0.290	0.013
Underestimation	56 (75.7)	40 (85.1)	16 (59.3)		
Accurate estimation	18 (24.3)	7 (14.9)	11 (40.7)		
Obese (n = 59)				0.352	0.007
Underestimation	11 (18.6)	10 (31.3)	1 (3.7)		
Accurate estimation	48 (81.4)	22 (68.8)	26 (96.3)		

Data are presented as n (%). Underweight participants were not included in this table due to the small sample size (n = 5).

^{a)}Cramer's V effect sizes were judged as negligible associations if <0.1, weak associations if between 0.1 and <0.2, moderate associations if between 0.2 and <0.4, and strong if ≥0.4.

living on campus, (2) household income (\$30,000–\$59,999), (3) being below the poverty threshold, (4) having fair or poor perceived health, (5) not being informed of being overweight by a doctor, (6) longer daily screen time, (7) eating fast food ≥ 3 times/week, and (8) drinking a soft drink ≥ 3 times/week (p < 0.05). Lower odds of weight gain were associated with male sex and eating ≥ 3 servings of fruits and vegetables (p < 0.05) (Table 4).

Discussion

The present study aimed to fill a research gap by examining the prevalence of overweight/obesity and investigating sex differences in body weight perception and correlates of ≥ 5% weight gain in the past year in a sample of students at HBCUs. The overweight/obesity rate of students at HBCUs was found to be 60.7%, which was much higher than that (38.3%) of a nationally representative sample of Black college students in the USA [9]. In addition, the overweight/obesity rate (60.7%) in the current study was markedly higher than that (36.8%) of a nationally representative sample of US college students who completed the American College Health Association-National College Health Assessment in 2016 [28].

Similar to other studies of college students finding that females estimated their body weight more correctly than males [11,15], the females in this study were significantly more likely than the males to accurately estimate their body weight, regardless of their weight categories. A previous study reported that among US adults with overweight or obesity, males were less likely than females to perceive their weight accurately [29]. A possible explanation is that males perceive a more muscular and athletic body type as an ideal shape because social norms among males may shape

preferences for a heavier body [30,31]. Moreover, females may be scrutinized more intensely than males regarding social standards of beauty and in response may be more diligent at keeping records of their weight [32,33]. The present study showed that the prevalence of overweight/obesity among male students in 2016 was 65.9%, which was much higher than that of overweight/obesity (42.2%) among male students who completed the American College Health Association-National College Health Assessment in the same year [28]. The higher overweight/obesity prevalence among male students in the current sample may be due, in part, to inaccurate body weight perceptions [34]. Research has shown that accurate weight perception is associated with the desire to lose weight [35] and plays an important role in maintaining a healthy weight [14,36]. There is a need to establish effective programs to prevent or rectify body weight misperceptions, especially in Black male college students at HBCUs. Thus, it is important for college health professionals at HBCUs to develop health education programs that help their male students perceive their weight accurately, which may result in a lower overweight/obesity rate.

Excellent or very good perceived overall health was predictive of weight underestimation. Another possible cause of weight underestimation is visual weight status misperceptions, but this factor was not directly measured in the current study. Oldham and Robinson [37] found that frequent visual exposure to people with obesity can alter one's perception of how a healthy body weight appears and lead to an underestimation of weight. Therefore, given the high rates of overweight and obesity in Black communities [38,39], it is possible that heavy weights may appear normal and healthy in these settings and that those who underestimate their weight may also have a false sense of perceived good health [40]. In addition to

Table 3. Correlates of body weight underestimation ($n = 82$) compared to correct body weight estimation ($n = 129$)

Variable	OR (95% CI)
Age (y)	
18–19	1.02 (0.59–1.78)
≥ 20	1.00
Sex	
Male	4.46 (2.40–8.30) ^{***}
Female	1.00
Campus setting	
Very large city	0.94 (0.52–1.67)
Rural town	1.00
Type of residence	
On-campus	1.43 (0.75–2.73)
Off-campus	1.00
Poverty threshold	
Above	1.00
Below	1.04 (0.46–2.35)
Perceived overall health	
Excellent/very good	1.00
Good	0.72 (0.39–1.31)
Fair/poor	0.15 (0.06–0.43) ^{***}
Informed of being overweight by a doctor	
Yes	1.00
No	2.81 (1.37–5.74) ^{**}
Metabolic equivalent (min/wk)	
< 500	1.00
≥ 500	3.21 (1.05–9.85) [*]
Daily sitting hours	1.04 (0.96–1.12)
Daily screen time	1.05 (0.99–1.11)
Monthly frequency of alcohol use (d)	
0	1.00
1–14	0.91 (0.51–1.62)
15–30	1.86 (0.52–6.57)
Daily fruit and vegetable consumption (serving)	
0	1.00
1–2	0.88 (0.35–2.27)
≥ 3	0.45 (0.15–1.35)
Weekly frequency of eating fast foods (time)	
0	1.00
1–2	2.01 (0.88–4.61)
≥ 3	1.75 (0.81–3.79)
Weekly frequency of drinking a soft drink or soda containing sugar (time)	
0	1.00
1–2	1.33 (0.61–2.90)
≥ 3	1.77 (0.89–3.51)

We excluded underweight participants ($n = 5$) and normal weight participants who overestimated their body weight ($n = 3$) due to the small cell size.

OR, odds ratio; CI, confidence interval.

^{*} $p < 0.05$, ^{**} $p < 0.01$, ^{***} $p < 0.001$.

the aforementioned correlate of weight underestimation, not being informed by a doctor of having overweight or obesity was associated with weight underestimation. This underscores the important role that health care providers at student health centers can play when it comes to openly speaking about weight-related issues with Black students who underestimate their weight. Weight underestimation was reported to be more prevalent in Black college students than in other racial/ethnic groups in a nationally representative sample of college students, thereby highlighting racial/ethnic differences in weight underestimation among US college students [14]. Therefore, it is important for college health educators at HBCUs to understand more correlates of weight underestimation and to provide regular check-ups or health screenings for their students. In addition, future research should include a large sample of Black students at HBCUs using probability sampling techniques.

This study found that 62.9% of participants who had overweight or obesity experienced weight gain, defined as a 5% or greater weight increase relative to weight 1 year ago, which is in accord with previous evidence that weight gain is one of the most common negative health consequences among college students [7]. Living on campus and not having been informed by a doctor of having overweight or obesity were associated with weight gain. The present study findings reinforce the importance of college health care providers, who can provide effective communication about weight gain for college students and, in particular, those at HBCUs. Overweight and obesity in college can be a powerful determinant of excess body weight in middle adulthood [41]. Colleges and universities are an ideal place to educate students on health behaviors and to promote healthy weight maintenance [9]. Considering that most colleges and universities have resources (e.g., student wellness programs and fitness centers) on campus, it is necessary for college health staff and campus administrators at HBCUs to promote healthy weight-related behaviors by encouraging students living on campus to use those resources. Moreover, it is imperative that HBCUs monitor and address weight gain among students as early as possible.

Limitations of this study include the cross-sectional nature of the data, which prevents a determination of causality between sociodemographic or behavioral factors and perceived weight or weight gain. Second, survey data were based on self-reports, which are susceptible to recall bias. However, unlike previous college obesity studies [11,14,42] that were based on self-reported height and weight, this study used measured height and weight. A previous study reported that BMI values computed from

Table 4. Correlates of weight gain^{a)} among overweight and obese students (*n* = 132)

Variable	≥ 5% weight gain (%)	OR (95% CI)
Total	58.3	
Age (y)		
18–19	62.9	1.48 (0.73–3.00)
≥ 20	53.2	1.00
Sex		
Male	50.0	0.43 (0.20–0.94) [†]
Female	70.4	1.00
Campus setting		
Very large city	58.7	1.35 (0.64–2.87)
Rural town	58.1	1.00
Type of residence		
On-campus	62.5	2.46 (1.12–5.38) [†]
Off-campus	47.2	1.00
Poverty threshold		
Above	54.8	1.00
Below	78.9	5.99 (1.32–27.29) [*]
Perceived overall health		
Excellent/very good	41.9	1.00
Good	58.3	1.81 (0.82–4.01)
Fair/poor	82.8	5.03 (1.62–15.63) ^{**}
Informed of being overweight by a doctor		
Yes	51.0	1.00
No	63.7	2.07 (1.01–4.30) [†]
Metabolic equivalent (min/wk)		
< 500	81.8	1.00
≥ 500	55.9	0.35 (0.07–1.69)
Daily sitting hours	-	1.02 (0.92–1.12)
Daily screen time	-	1.02 (1.01–1.05) [†]
Monthly frequency of alcohol use (d)		
0	45.7	1.00
1–14	64.1	0.73 (0.30–1.81)
15–30	75.0	1.39 (0.45–4.29)
Daily fruit and vegetable consumption (serving)		
0	85.7	1.00
1–2	57.3	0.16 (0.02–1.35)
≥ 3	48.3	0.09 (0.01–0.83) [†]
Weekly frequency of eating fast foods (time)		
0	44.0	1.00
1–2	59.5	2.55 (0.98, 7.04)
≥ 3	63.1	2.67 (1.04, 6.86) [*]
Weekly frequency of drinking a soft drink or soda containing sugar (time)		
0	46.9	1.00
1–2	58.3	1.88 (0.65–5.38)
≥ 3	64.1	3.21 (1.21–8.55) [†]
Body weight perception		
Underestimation	62.7	0.98 (0.49–1.99)
Accurate estimation	63.1	1.00

OR, odds ratio; CI, confidence interval.

^{a)}Defined as a 5% or greater weight increase relative to weight 1 year ago.

^{*}*p* < 0.05, ^{**}*p* < 0.01.

self-reported height and weight were 1.16 kg/m² lower than measured BMI values. In the current study, participants' BMI was accurately measured, and self-reporting bias of BMI was not present. Third, caution is needed to generalize our findings to students at other HBCUs as the study data were collected at only 2 HBCUs with a small sample size. Fourth, multivariable logistic regression in this study could not take covariates into account because it produced unstable adjusted ratios and 95% confidence intervals due to the small sample size. Finally, residual confounding by unmeasured variables is always a possibility when dealing with observational studies, and a broader list of correlates of weight perception and weight gain may be needed.

Despite these limitations, the present study adds to the knowledge base by reporting the prevalence of overweight/obesity and investigating sex differences in body weight perceptions and correlates of weight gain (defined as a 5% or greater weight increase in comparison with weight 1 year ago) in students at 2 HBCUs. The college years are associated with many life changes that can impact behaviors in a way that is conducive to weight gain [5]. Examples include unhealthy eating behaviors, reduced physical activity, increased sedentary behavior including screen time, and high levels of stress [27,43,44]. More importantly, the factors that can lead to weight gain can be quite different between individuals [5]. A one-size-fits-all approach aimed at addressing the barriers to healthy behaviors and contributors to weight gain is unlikely to work in such a context. Instead, it is important to develop individualized health promotion programs for college students and to address the root causes of the problem to maximize success.

Notes

Ethics Approval

The study was approved by the Institutional Review Board of Tennessee State University (IRB No: HS2015-3675) and University of Maryland Eastern Shore (IRB No: #2016-016). All participants provided written consent for their personal data to be used.

Conflicts of Interest

The authors have no conflicts of interest to declare.

Funding

None.

Availability of Data

All data generated or analysed during this study are included in this published article.

References

- American College Health Association (ACHA). American College Health Association-National College Health Assessment II: reference group executive summary, Fall 2008 [Internet]. Baltimore, MD: ACHA; 2009 [cited 2016 Aug 16]. Available from: https://www.acha.org/NCHA/ACHA-NCHA_Data/Publications_and_Reports/NCHA/Data/Reports_ACHA-NCHAI.aspx.
- American College Health Association (ACHA). American College Health Association-National College Health Assessment III: reference group executive summary, Fall 2019 [Internet]. Silver Spring, MD: ACHA; 2020 [cited 2020 May 16]. Available from: https://www.acha.org/NCHA/ACHA-NCHA_Data/Publications_and_Reports/NCHA/Data/Reports_ACHA-NCHAI.aspx.
- National Center for Health Statistics. Health, United States, 2007, with chartbook on trends in the health of Americans [Internet]. Hyattsville, MD: National Center for Health Statistics; 2007 [cited 2016 Jun 29]. Available from: <http://www.cdc.gov/nchs/data/health/us07.pdf#listfigures>.
- Ogden CL, Carroll MD, Kit BK, et al. Prevalence of childhood and adult obesity in the United States, 2011-2012. *JAMA* 2014;311:806-14.
- Cluskey M, Grobe D. College weight gain and behavior transitions: male and female differences. *J Am Diet Assoc* 2009;109:325-9.
- Crombie AP, Ilich JZ, Dutton GR, et al. The freshman weight gain phenomenon revisited. *Nutr Rev* 2009;67:83-94.
- Calamidas EG, Crowell TL. A content analysis of college students' health behaviors. *Am J Health Educ* 2018;49:133-46.
- Yan Z, Harrington A. Factors that predict weight gain among first-year college students. *Health Educ J* 2020;79:94-103.
- Nelson TF, Gortmaker SL, Subramanian SV, et al. Disparities in overweight and obesity among US college students. *Am J Health Behav* 2007;31:363-73.
- Lynch E, Liu K, Wei GS, et al. The relation between body size perception and change in body mass index over 13 years: the Coronary Artery Risk Development in Young Adults (CARDIA) study. *Am J Epidemiol* 2009;169:857-66.
- Gibbs HD, Pacheco C, Yeh HW, et al. Accuracy of weight perception among American Indian tribal college students. *Am J Prev Med* 2016;51:e139-44.
- Lynch EB, Kane J. Body size perception among African American women. *J Nutr Educ Behav* 2014;46:412-7.
- Park E. Overestimation and underestimation: adolescents' weight perception in comparison to BMI-based weight status and how it varies across socio-demographic factors. *J Sch Health* 2011;81:57-64.
- Lee J, Sa J, Chaput JP, et al. Racial/ethnic differences in body weight perception among U.S. college students. *J Am Coll Health* 2018;66:429-37.
- Gross SM, Gary TL, Browne DC, et al. Gender differences in body image and health perceptions among graduating seniors from a historically black college. *J Natl Med Assoc* 2005;97:1608-19.
- Chithambo TP, Huey SJ. Black/white differences in perceived weight and attractiveness among overweight women. *J Obes* 2013;2013:320326.

17. American College Health Association (ACHA). Generalizability, reliability, and validity analysis [Internet]. Silver Spring, MD: ACHA [cited 2016 Aug 1]. Available from: https://www.acha.org/NCHA/NCHA/About/Generalizability__Reliability__and__Validity_Analysis_NCHA_I.aspx.
18. Parcel TL, Menaghan EG. Measuring behavioral problems in a large cross sectional survey: reliability and validity for children of the NLS youth. Columbus, OH: Department of Sociology, The Ohio State University; 1988.
19. Schuna JM Jr, Johnson WD, Tudor-Locke C. Adult self-reported and objectively monitored physical activity and sedentary behavior: NHANES 2005-2006. *Int J Behav Nutr Phys Act* 2013;10:126.
20. Flegal KM, Carroll MD, Kit BK, et al. Prevalence of obesity and trends in the distribution of body mass index among US adults, 1999-2010. *JAMA* 2012;307:491-7.
21. Singh K, Mehta K, Shaikh NM, et al. Trabeculectomy with intraoperative mitomycin C versus 5-fluorouracil. Prospective randomized clinical trial. *Ophthalmology* 2000;107:2305-9.
22. Riddle DL, Singh JA, Harmsen WS, et al. Clinically important body weight gain following total hip arthroplasty: a cohort study with 5-year follow-up. *Osteoarthritis Cartilage* 2013;21:35-43.
23. U.S. Department of Health and Human Services. Appendix 1. Translating scientific evidence about total amount and intensity of physical activity into guidelines [Internet]. Washington, DC: U.S. Department of Health and Human Services; [cited 2016 Aug 1]. Available from: <https://health.gov/paguidelines/guidelines/appendix1.aspx>.
24. U.S. Department of Health and Human Services. 2015 Poverty guidelines [Internet]. Washington, DC: U.S. Department of Health and Human Services; 2015 [cited 2016 Dec 15]. Available from: <https://aspe.hhs.gov/2015-poverty-guidelines>.
25. Janssen I, Carson V, Lee IM, et al. Years of life gained due to leisure-time physical activity in the U.S. *Am J Prev Med* 2013;44:23-9.
26. Bennett GG, Wolin KY. Satisfied or unaware? Racial differences in perceived weight status. *Int J Behav Nutr Phys Act* 2006;3:40.
27. Racette SB, Deusinger SS, Strube MJ, et al. Changes in weight and health behaviors from freshman through senior year of college. *J Nutr Educ Behav* 2008;40:39-42.
28. American College Health Association (ACHA). American College Health Association-National College Health Assessment II: reference group executive summary, Spring 2016 [Internet]. Hanover, MD: ACHA; 2016 [cited 2017 Mar 1]. Available from: https://www.acha.org/NCHA/ACHA-NCHA_Data/Publications_and_Reports/NCHA/Data/Reports_ACHA-NCHAIIC.aspx.
29. Tsai SA, Lv N, Xiao L, et al. Gender differences in weight-related attitudes and behaviors among overweight and obese adults in the United States. *Am J Mens Health* 2016;10:389-98.
30. Duncan DT, Wolin KY, Scharoun-Lee M, et al. Does perception equal reality? Weight misperception in relation to weight-related attitudes and behaviors among overweight and obese US adults. *Int J Behav Nutr Phys Act* 2011;8:20.
31. Christensen VT. Gendered perceptions of own and partner weight-level. *Health (London)* 2012;16:382-99.
32. Abbott BD, Barber BL. Embodied image: gender differences in functional and aesthetic body image among Australian adolescents. *Body Image* 2010;7:22-31.
33. Buote VM, Wilson AE, Strahan EJ, et al. Setting the bar: divergent sociocultural norms for women's and men's ideal appearance in real-world contexts. *Body Image* 2011;8:322-34.
34. Langellier BA, Glik D, Ortega AN, et al. Trends in racial/ethnic disparities in overweight self-perception among US adults, 1988-1994 and 1999-2008. *Public Health Nutr* 2015;18:2115-25.
35. Wharton CM, Adams T, Hampl JS. Weight loss practices and body weight perceptions among US college students. *J Am Coll Health* 2008;56:579-84.
36. Dorsey RR, Eberhardt MS, Ogden CL. Racial/ethnic differences in weight perception. *Obesity (Silver Spring)* 2009;17:790-5.
37. Oldham M, Robinson E. Visual weight status misperceptions of men: why overweight can look like a healthy weight. *J Health Psychol* 2016;21:1768-77.
38. Corral I, Landrine H, Hao Y, et al. Residential segregation, health behavior and overweight/obesity among a national sample of African American adults. *J Health Psychol* 2012;17:371-8.
39. Lim S, Harris TG. Neighborhood contributions to racial and ethnic disparities in obesity among New York city adults. *Am J Public Health* 2015;105:159-65.
40. Robinson E, Kirkham TC. Is he a healthy weight? Exposure to obesity changes perception of the weight status of others. *Int J Obes (Lond)* 2014;38:663-7.
41. Zajacova A, Burgard SA. Body weight and health from early to mid-adulthood: a longitudinal analysis. *J Health Soc Behav* 2010;51:92-107.
42. Nelson MC, Larson NI, Barr-Anderson D, et al. Disparities in dietary intake, meal patterning, and home food environments among young adult nonstudents and 2- and 4-year college students. *Am J Public Health* 2009;99:1216-9.
43. Economos CD, Hildebrandt ML, Hyatt RR. College freshman stress and weight change: differences by gender. *Am J Health Behav* 2008; 32:16-25.
44. Sa J, Heimdal J, Sbrocco T, et al. Overweight and physical inactivity among African American students at a historically black university. *J Natl Med Assoc* 2016;108:77-85.